Life History and Health Status of Pacific Marine Turtles

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Review of NOAA Fisheries' Science on Marine Mammals & Turtles
Southwest and Northwest Fisheries Science Centers
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La Jolla, CA

Five sea turtle species in the eastern Pacific Ocean

Leatherback (E)

Loggerhead (E)

Green turtle (E*)

Hawksbill (E)

Olive Ridley (T)

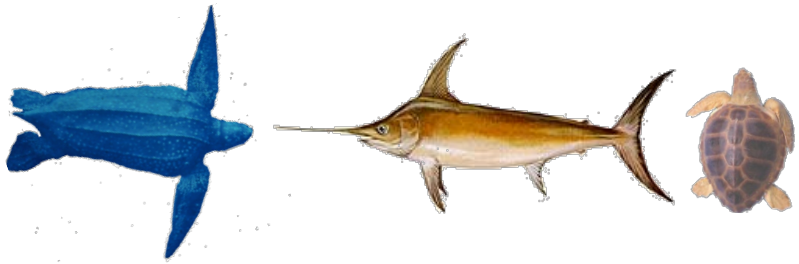
US West Coast sea turtle conservation areas

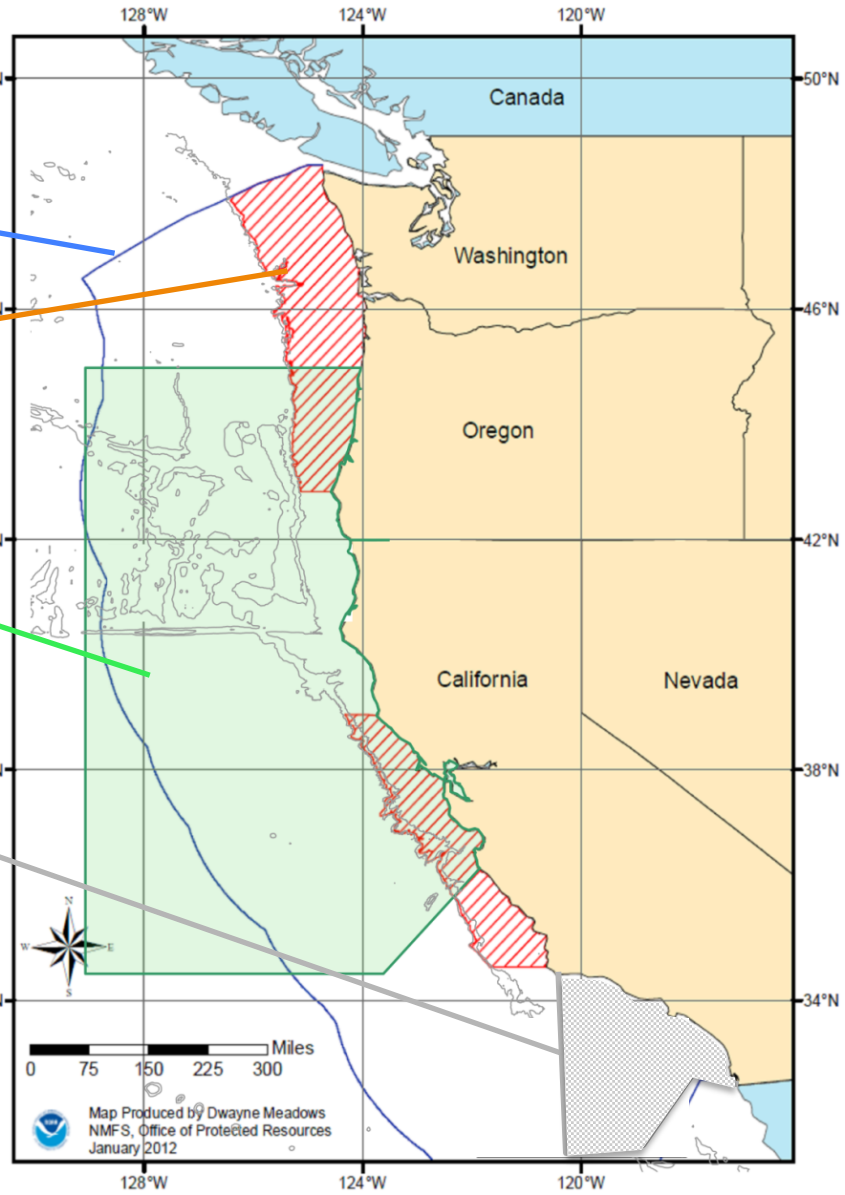
West Coast EEZ

Leatherback critical habitat

Leatherback closure area
(15 Aug-15 Nov)

Loggerhead closure area
(ENSO trigger)





Links with Mandates, Needs of Regulatory Partners

Mandate	*Management Needs*
Endangered Species Act	5-Year Biological Reviews Critical Habitat Designation Demographic data Life-history data
Sea Turtle Recovery Plans	Biological data, bycatch reduction
Magnuson-Stevens Act	Build science capacity with int. partners Bycatch reduction technology Demographic data and bycatch levels
U.S. West Coast fisheries	Scientific advice (WCRO, NWFSC, PFMC)
San Diego Bay management	Demographic and habitat use data (Unified Port of SD, Navy)
Inter-American Convention	Scientific oversight and advice for COP Build science capacity with int. partners

Stock Assessment Improvement Plan

NMFS 2004

Tier I - Improve Stock Assessments Using Existing Data Collection Resources

This tier maintains the status quo with no new assessment efforts.

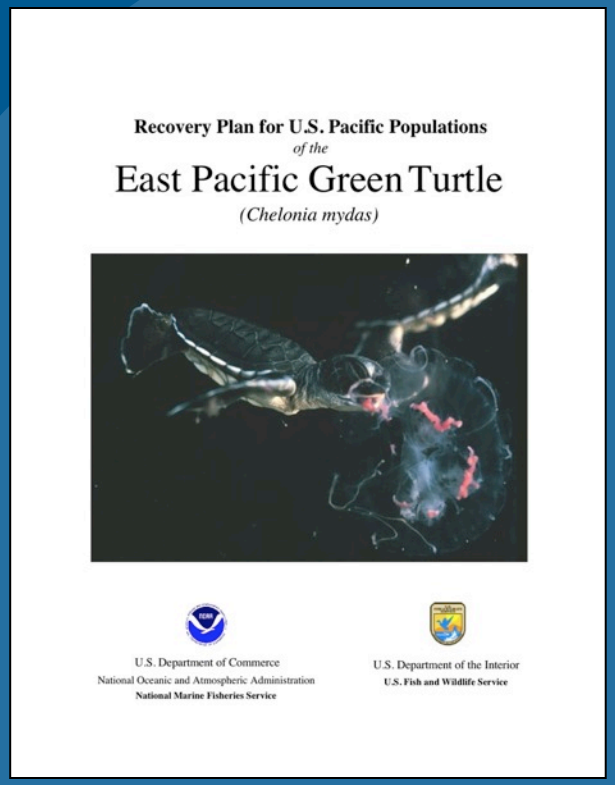
Tier II - Elevate Stock Assessments to New National Standards of Excellence:

At this Tier the quality of all sea turtle stock assessments should achieve a level commensurate with ESA mandates (life-history, abundance, etc).

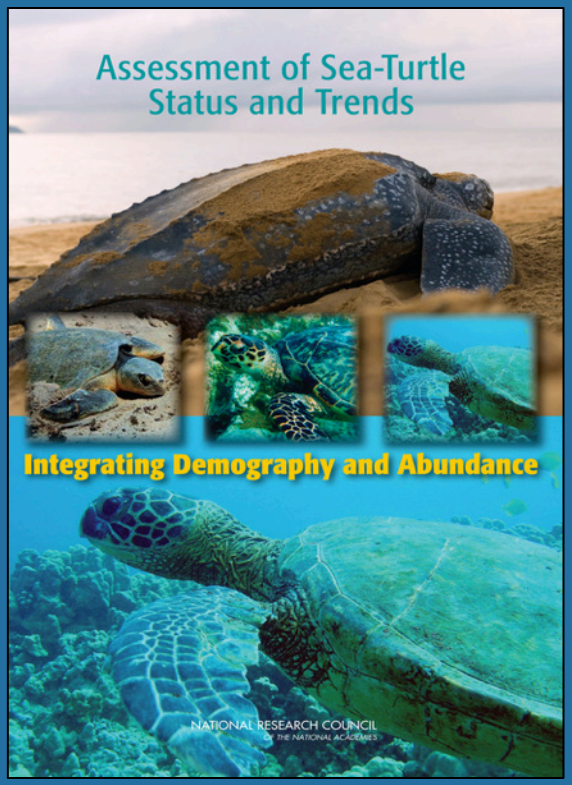
Tier III - Next Generation Assessments

Collection of detailed data on ecology, habitat, behavior, and health of "Ecosystem Indicator Species" to provide a better understanding of how marine turtles function within their respective ecosystems

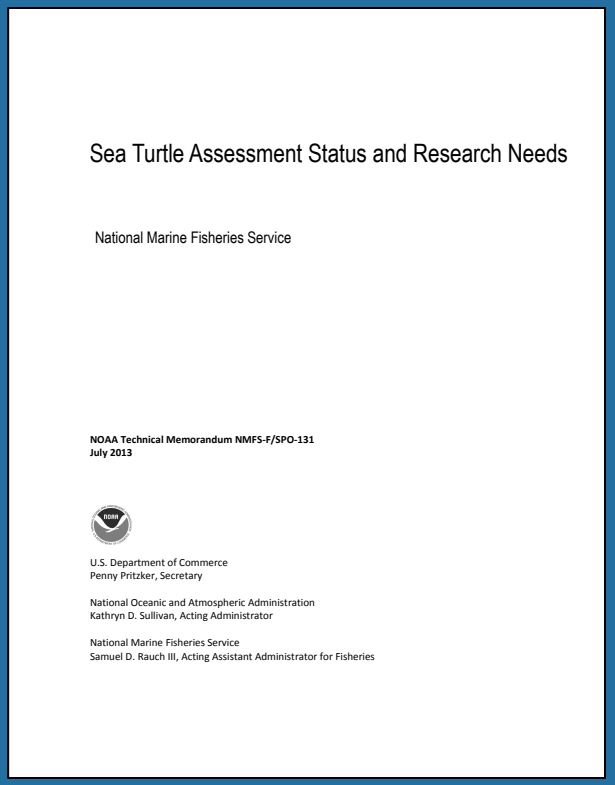
Blueprints for research and assessment of U.S. Pacific sea turtle populations



Recovery Plans (1998)



NRC Report (2010)



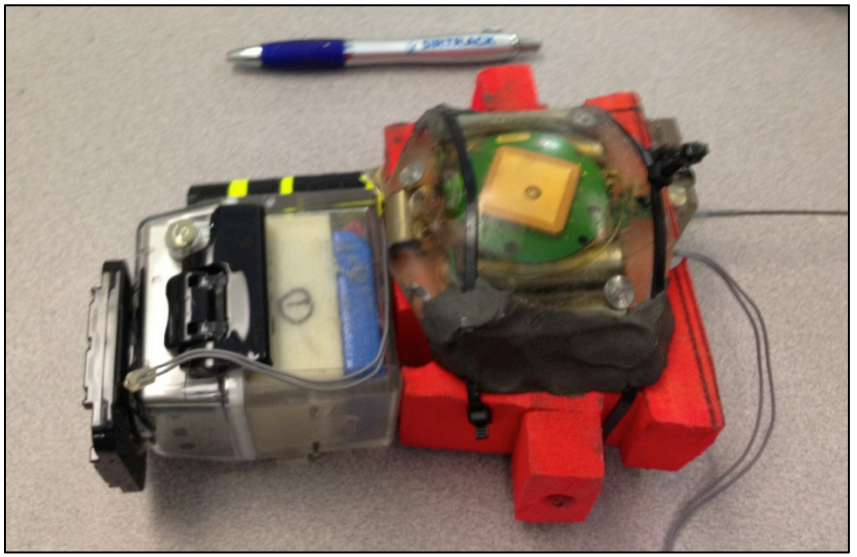
Turtle SAIP Report (2013)

Our research infrastructure:

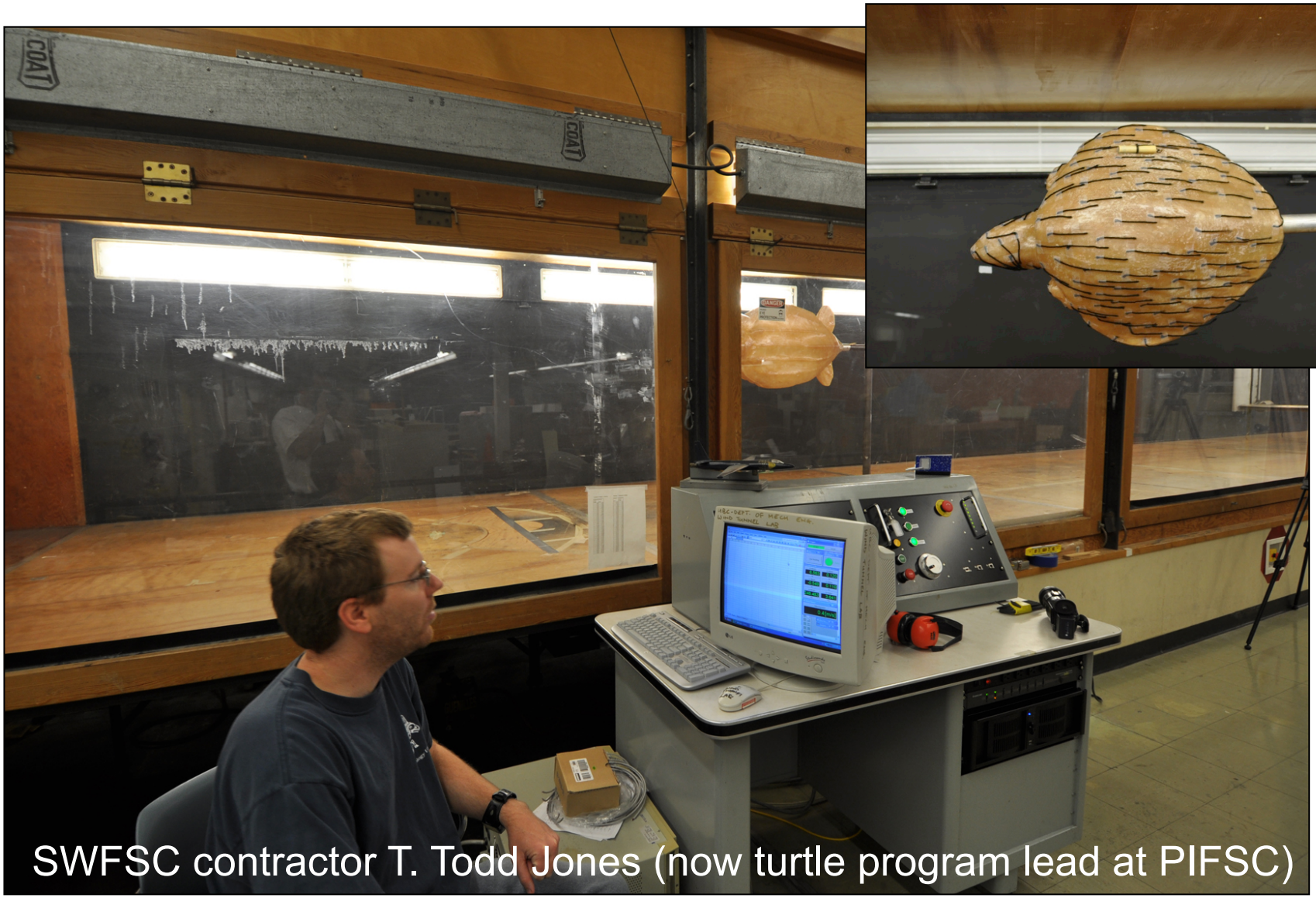
- answer questions about demography, foraging ecology, habitat use, migration, health
- novel and traditional tools and techniques
- stranding response & necropsy
- field data collection / lab analysis
- highly collaborative

Biotelemetry

- ARGOS GPS & satellite tags
- archival & sonic tags
- depth and temperature
- video
- emphasis on miniaturization
- establish drag coefficients

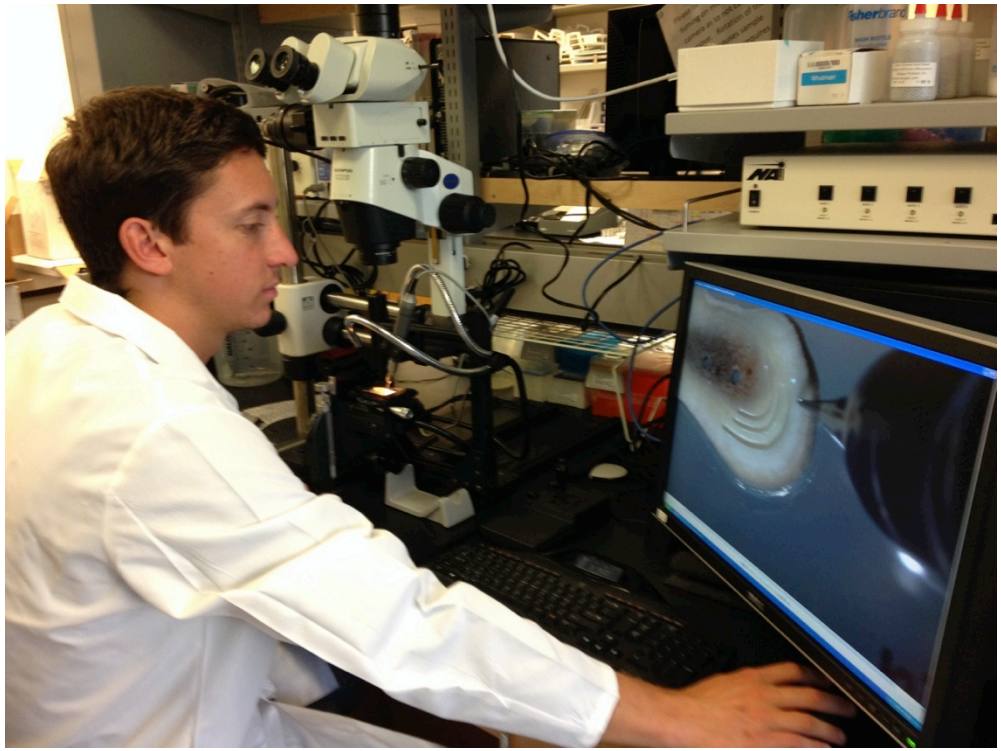


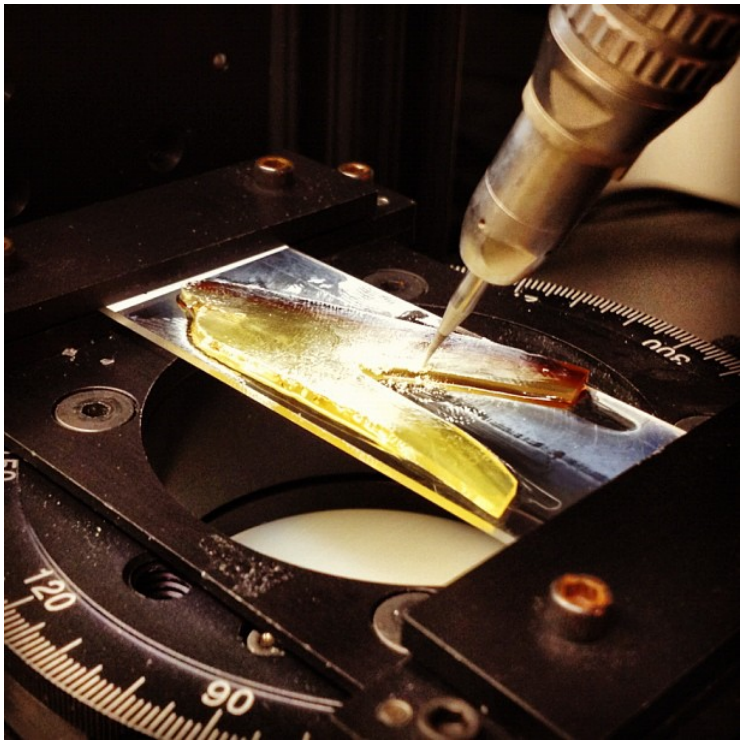
Wind flume trials, transmitter drag, and best-practice attachment procedures for sea turtle biotelemetry studies



SWFSC contractor T. Todd Jones (now turtle program lead at PIFSC)

SWFSC Stable Isotope Lab



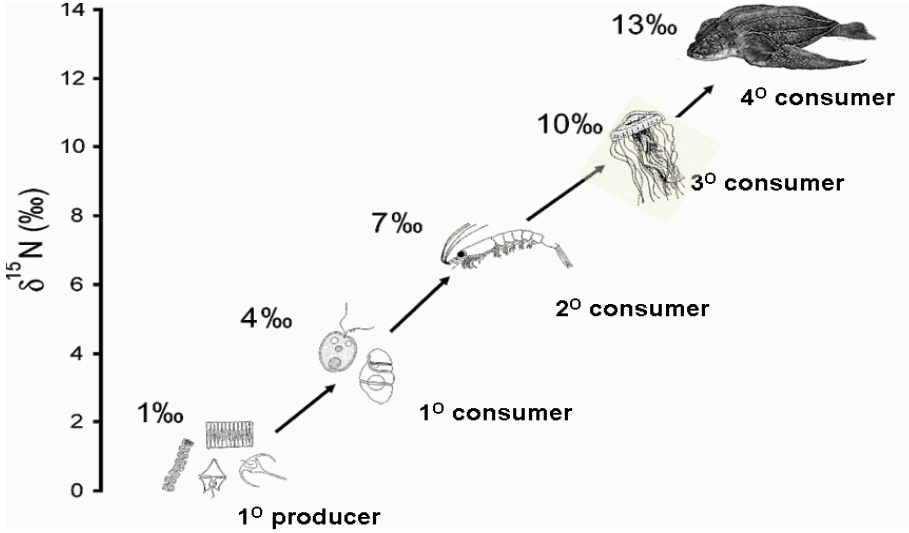


- Fully loaded pre-ms lab
- Multiuser facility
- bulk tissue SIA prep
- $\delta^{15}N$ amino acid prep

- 18K tissue SI values
- hard tissue micromlling
- soft tissue SIA

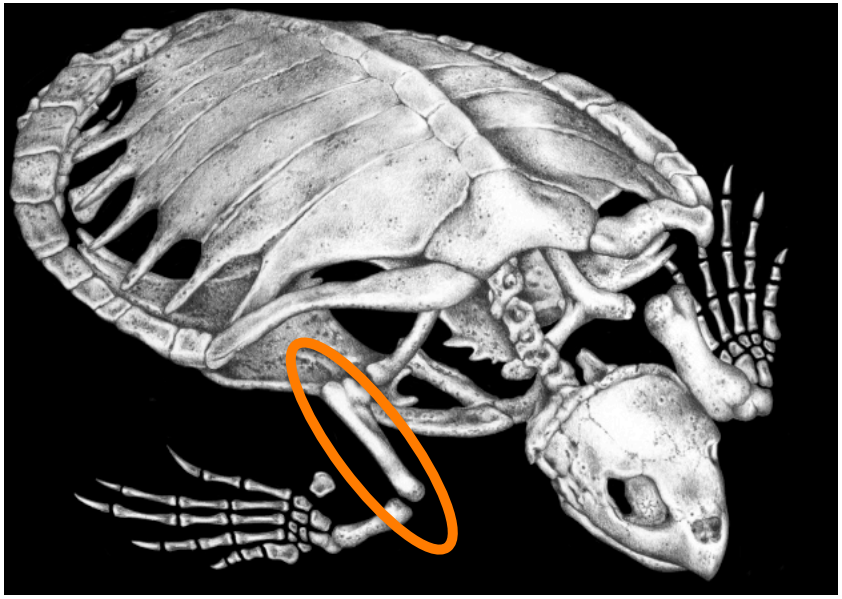
SWFSC Stable Isotope Lab

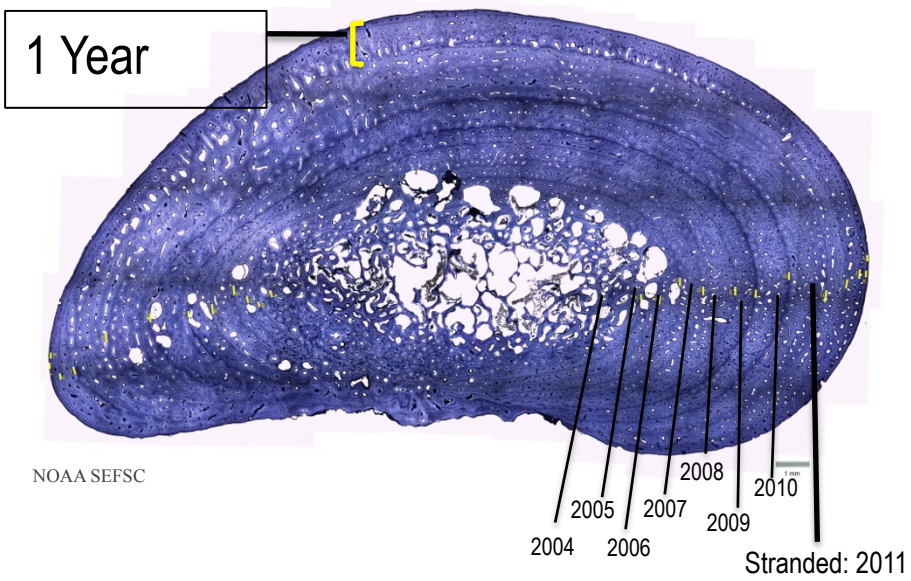
- We pursue validation studies for SI discrimination and turnover
- Ongoing efforts to discern trophic vs baseline influences on SI values



- We develop and publish methods for bone and scute SIA analysis
- We integrate bulk-tissue SIA and CSIA-AA with satellite telemetry to develop marine isoscape maps for the Pacific
- We use SIA with skeletochronology to explore long-term habitat use

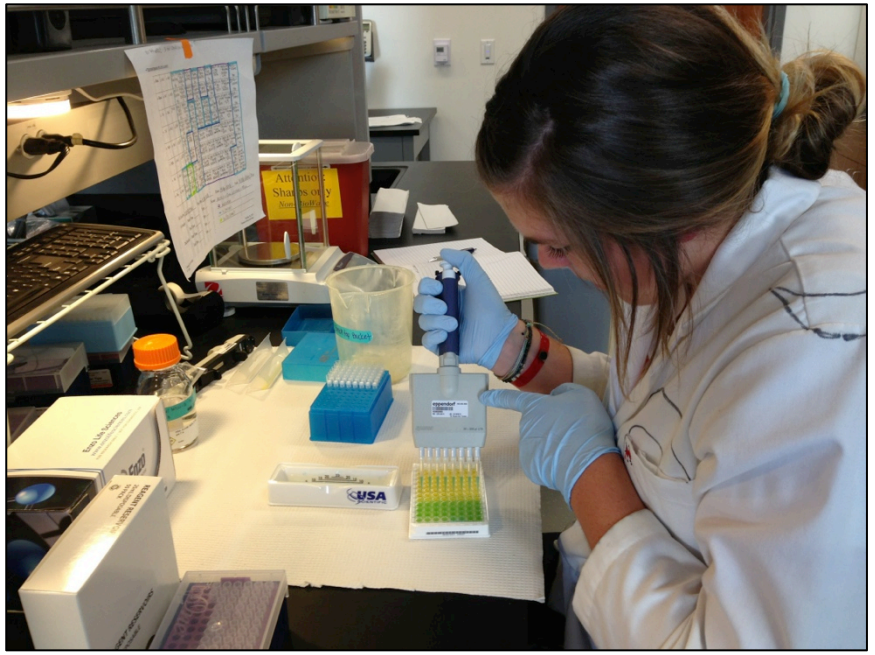
SWFSC Skeletochronology ‘Lab’





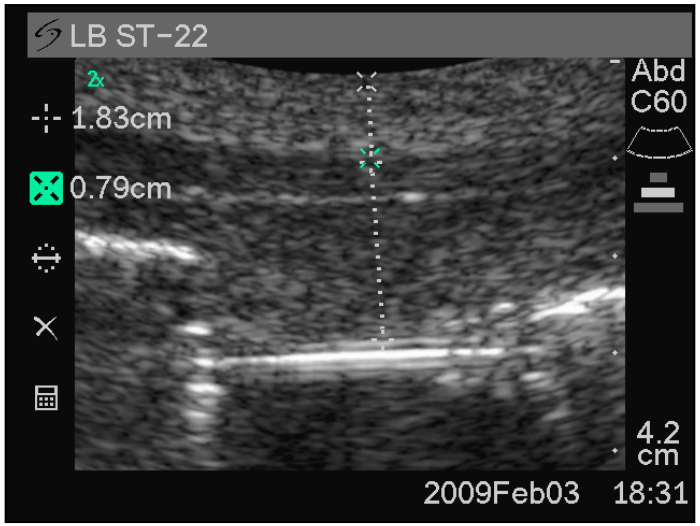
- Housed in the Marine Mammal Stranding Lab
- Soon to be only NMFS lab with skeletrochonology capabilities
- NMFS contractor and PhD Student Cali Turner Tomaszewicz on soft money
- Ongoing field efforts to validate annularity of growth rings (oxytetracycline

SWFSC Sea Turtle Hormone ‘Lab’



- Extraction and isolation of hormones from plasma
- Quantify Testosterone concentration to determine individual sex
- Many national and international collaborations
- Synergies with the Marine Mammal Hormone Lab (Nick Kellar)
- No dedicated lab bench space; NRC post-doc Camryn Allen and all lab activities are on soft money

Sea turtle health, body condition, & contaminants



- Leatherbacks in CA; green turtles in SD Bay, San Gabriel River
- Ultrasound fat to quantify body condition
- Measure POPs, heavy metals, emerging pollutants / pathogens with changing nutritional condition
- Collaboration with NIST, Heather Harris, Lisa Komoroske

Sea turtle stranding response

- Local strandings of turtles with capture histories
- Unmarked turtles from CA to AK

Major research efforts for turtle life-history

ANNUAL

Green turtle foraging ecology and habitat use in Southern California
(summer and fall)

ELISA validation and sex ratio analysis around the world
(lab work year-round)

Age and habitat use of loggerheads and green turtles in the eastern Pacific
(lab work year-round)

Stranding response and necropsy

ROTATIONAL

Leatherback movements, foraging ecology and health status in Central California
(used to be annual, now every 3 yrs; next effort in Fall 2016)

Loggerhead movements and foraging ecology in the southern California bight
(ENSO years; 1st cruise in April 2015, next survey in Fall 2015)

Eastern Pacific hawksbill movements and migration
Ecuador, El Salvador, Nicaragua & Panama (suspended in 2014 due to lack of funds)

Ecological research on green turtles in southern CA

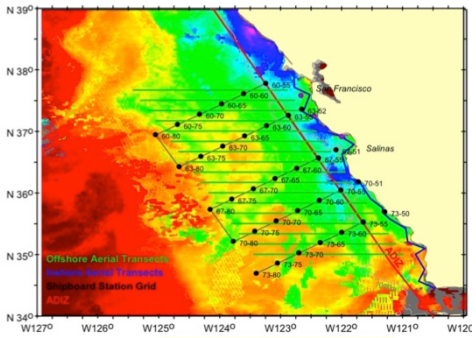
Urban ecosystems and impacts of power plants

San Diego Bay, 2010

San Gabriel River, 2014

Leatherback research in central California

- Collaboration with Moss Landing Marine Labs
- An ecosystem assessment in offshore waters of central California, including traditional swordfish fishing grounds
- Identify leatherback foraging areas via shipboard oceanographic and prey sampling, aerial surveys, satellite telemetry
- Determine how areas used by leatherbacks may overlap with swordfish habitat
- Link with SIA, body condition, and health



Strengths

- Our people – committed, experts in field, high performers, good collaborators
    - *Stable isotopes*
    - *Hormone analysis*
    - *Skeletochronology*
    - *Biotelemetry*
    - *In-water research*
- Our infrastructure: SI, hormone, skeleto., necropsy labs
- Our tissue collection, hormone, and SI database
- NMFS' go-to lab for science advice about marine turtles
- International leaders with many collaborations worldwide
- Emphasis on science mentoring and capacity building

Challenges

Process and Infrastructure

- Maintaining continuity with scientific and technical personnel
- Operating SIA and hormone labs: equipment / repairs / sample throughput
- Data management and reporting

Science

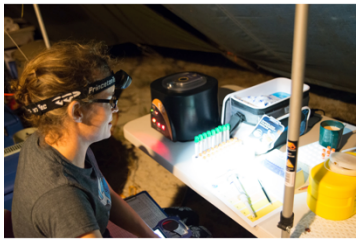
- Staying relevant / at forefront as data providers and capacity builders
- Maintaining national & international collaborations / attending meetings
- Long-term viability for leatherback research in the California Current LME
- Building momentum with loggerhead research to inform MSRA / WCRO
- Responding to / processing stranded turtles in SoCA
- Greater assistance to HQ activities = less time for empirical data production

Strategies

- Modify research priorities as needed to meet management needs
- Conduct analyses that make use of existing datasets (telemetry, SIA)
- Foster partnerships outside SWFSC (NMFS SCs, FWS, NOS, Navy, Unified Port of SD, Universities, NGOs)
- Be active with internal and external proposal writing
- Cultivate a US West Coast sea turtle stranding network
- Human resources: committed to backfilling turtle data manager position; explore all options for retaining PIs
- Workplace: acknowledge and reward excellence; offer training opportunities; promote safety in the lab and field

Today's case studies

Studying sea turtle demography with novel techniques
Peter Dutton

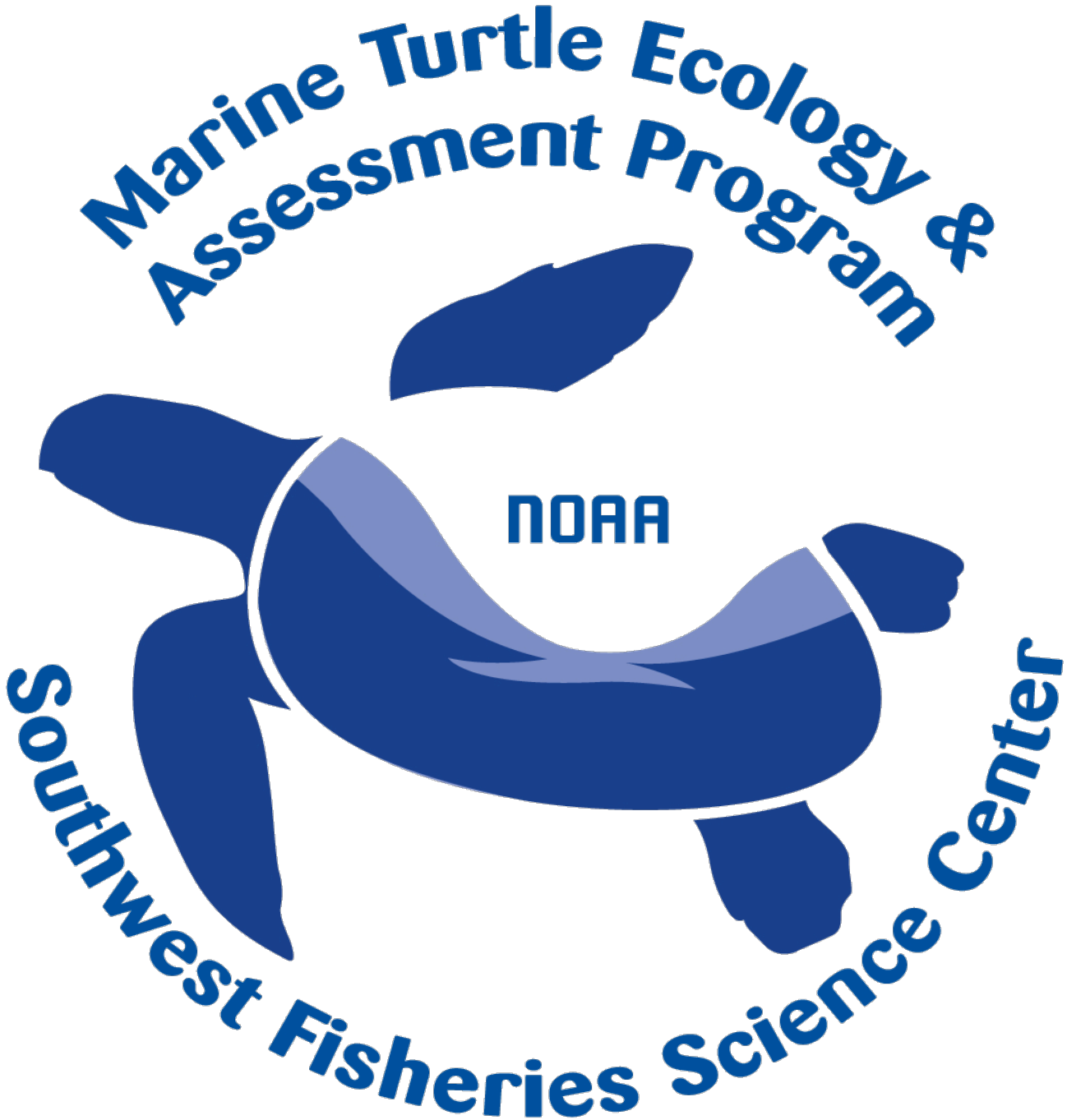


Developing and applying a hormone assays to study sex ratio
Camryn Allen

Studying age and long-term habitat use
Cali Turner Tomaszewicz

Injecting hope into hawksbill recovery
Alexander Gaos

Developing a sea turtle stranding response capability
Robin LeRoux


Marine Turtle Ecology &
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